1. OVERVIEW

Subject area	Photonics
Degree	Bachelor's Degree in Physics
School/Faculty	School of Architecture, Engineering and Design
Year	Fourth
ECTS	6
Type	Optional
Language(s)	Spanish
Delivery mode	On campus
Semester	Seventh

2. INTRODUCTION

This elective subject area explores aspects of physics related to optical phenomena, which form the basis of modern technological devices, such as optical fibres, lasers and other electro-optic technologies and components, which are classed as photonic technologies.

The aim is to introduce the main optical and electromagnetic properties of light and how it interacts with different materials. Students will analyse, model and explain the application of optical phenomena in new computing, electronics and communication technologies.

Students will show how these properties determine the characteristics, efficiency and limitations of some microelectronic and nanoelectronic photonic devices.

3. SKILLS AND LEARNING OUTCOMES

Key skills (CB, by the acronym in Spanish):

- CB4 - Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.
- CB5: Students have developed the learning skills necessary to undertake further study in a much more independent manner.

Transversal skills (CT, by the acronym in Spanish):

- CT5. Problem solving: Be able to critically evaluate information, separate complex situations into their constituent parts, recognise patterns, and consider alternatives, different approaches and perspectives in order to find optimal solutions and negotiate efficiently.

Specific skills (CE, by the acronym in Spanish):

- CE01 - To estimate orders of magnitude in order to interpret diverse phenomena.
- CE02 - To describe and analyse physical systems, identifying fundamental concepts and principles to make the approximations needed to build a simplified model.
- CE04 - To understand the laws and principles of physics, to identify their logical and mathematical structure, their experimental basis and the phenomena described through them.
- CE09 - To understand the processes for obtaining materials and the physical fundamentals and uses of materials.

Learning outcomes (RA, by the acronym in Spanish):

- To explain the behaviour of non-linear optical materials and non-linear effects.
- To state the foundations of different types of lasers and explain how they work.
- To describe the propagation of light in optical fibre and the behaviour of different integrated optical devices.

The following table shows how the skills developed in the subject area match up with the intended learning outcomes:

Skills	Learning outcomes
CB4, CG5, CT5, CE01, CE02, CE04	• To explain the behaviour of non-linear optical materials and non-linear effects
CB4, CG5, CT5, CE01, CE02, CE04	• To state the foundations of different types of lasers and explain how they work
CB4, CG5, CT5, CE04, CE09	• To describe the propagation of light in optical fibre and the behaviour of different integrated optical devices

4. CONTENTS

1. Optical materials with linear response to electromagnetic radiation.
2. Optical materials with non-linear response to electromagnetic radiation.
3. Concepts, model and types of lasers.
4. Characterisation of optical fibre and its associated phenomenology.
5. Photonic devices.

5. TEACHING/LEARNING METHODS

The types of teaching/learning methods are as follows:

- Collaborative learning: Students learn to collaborate with other people (classmates and professors) in order to find creative, comprehensive and constructive solutions to questions and problems that arise from the given case studies, using all relevant knowledge and material resources available.
- Problem-based learning: Students are given problems and asked to solve them, working individually or in groups.
- Lectures: Presentations by the professor with the necessary technological tools to maximise comprehension of the learning content.

- Guided academic activities: Individual and group work that is more independent, including information searches, written summaries, debates and the public defence of projects.

6. LEARNING ACTIVITIES

The types of learning activities, plus the amount of time spent on each activity, are as follows:

On campus:

Learning activity	Number of hours
Lectures	18
Asynchronous lectures	12
Oral presentations of projects and debates	6
Report writing	18
Assessment	6
Practical activities (problems, written work, projects, workshops and/or lab work)	30
Group tutorials	10
Independent working	50
TOTAL	**150**

7. ASSESSMENT

The assessment systems, plus their weighting in the final grade for the subject area, are as follows:

On campus:

Assessment system	Weighting
Individual on-campus knowledge tests (theory and/or practice)	50%
Oral defence	5%–10%
Submission of group and/or individual reports, written work, projects or exercises	15%-40%
Performance observation	10%–20%

On the Virtual Campus, when you open the subject area, you'll find details of your assessable tasks, including the submission dates and assessment procedures for each task.